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SECTION 559
PILING

559.01 DESCRIPTION. This work consists of furnishing and placing piling in accordance with these specifications and as shown on the plans.

559.02 MATERIALS. Furnish materials meeting requirements of the following Standard Specifications Section:

Portland Cement Concrete	501
Structural Steel Piles	711.10.1
Steel Pipe Piles	711.10.2

559.02.1 Inspection of Pile.

Steel Pile. Steel pile may be inspected at the rolling mill and will be inspected at the project. Furnish two (2) copies of the certified mill test reports showing the chemical and physical test results for each steel pile heat number included in the shipment.

The camber and sweep of steel pile will not exceed the tolerance calculated by using the following formula:

$$\text{Maximum Camber or Sweep, in inches.} = \frac{\text{1/8 inch x pile length in feet}}{\text{10 feet}}$$

Maximum camber or sweep allowed for metric piles is one (1) millimeter per one (1) meter of pile length.

Store and handle steel piles to prevent damage. Bent, deformed or kinked piles will be rejected.

559.02.2 Furnish Pile. Furnish pile quantities shown in the contract. If test piles are specified, furnish quantities as requested by the Project Manager's order list. The order list will specify the number, type and length of piles required.

The specified lengths are those required below cutoff. Adjust lengths for the difference between the cut off length and the pile position in the driving equipment. Increase pile lengths 300 mm (one foot) for steel and steel pipe pile. Remove and dispose of excess pile length after the pile is driven.

559.02.3 Metal Pile End Protection. Furnish prefabricated cast steel driving point or cutting shoe conforming to ASTM A27 requirements. Furnish cast steel driving point for H pile and inside-flanged, open-end cutting shoe for pipe pile. Weld driving point or cutting shoe to steel pile in accordance with ANSI/AASHTO/AWS D1.5 using welders certified by the Department or a Certified Welding Inspector.

559.02.4 Splicing Piles. Weld steel pile in accordance with AWS D1.5 requirements. Use 3 meter (10 foot) minimum spacing for steel pile splice welds.

559.03 CONSTRUCTION REQUIREMENTS.

559.03.1 Equipment for Driving Pile.

A. Pile Hammers. Drive pile with impact hammers that include air, steam, diesel or hydraulic hammers.

For air/steam hammers, provide equipment that will maintain the volume as specified by the manufacturer at the hammer as the pile is driven. Provide equipment with accurate pressure gauges that are easily read from ground level. Ensure that the striking parts of the hammer are at least one-third the weight of the helmet and the pile being driven or 1250 kg (2750 lbs), whichever is greater.

Provide open-end (single-acting) diesel hammers with rings or other indicators on the ram that permit visual determination of the hammer stroke as the pile is driven. Ten (10) working days before use on the project, furnish the Project Manager one copy of the hammer manufacturer's chart that equates the stroke and blows per minute for the hammer being used.

Provide closed-end (double-acting) hammers with an accurate bounce chamber pressure gauge that is easily read from ground level. Ten (10) working days before use on the project, furnish the Project Manager one copy of a chart, calibrated to the actual hammer performance that equates the bounce chamber pressure to the equivalent energy or stroke of the hammer.

Provide equipment for hydraulic hammers that are sized to maintain, at the hammer during driving, the manufacturer's specified volume and pressure. Provide equipment with accurate pressure gauges that are easily read from ground level.

Service pile will be installed with the approved equipment after the pile tip elevation for the ultimate pile capacity is established by load testing or test pile driven with an impact hammer.

Delays and additional costs resulting from load tests or other extra work required to drive test pile as a condition of approval of the non-impact hammer or driving aids is at Contractor's expense. If a vibratory hammer is approved, installation of service pile will be controlled based on power consumption, rate of penetration or specified tip elevation. Re-strike one of every ten pile driven with a vibratory hammer with an impact hammer having the energy to verify the ultimate pile capacity as required in Standard Specifications Section 559.03.3.

B. Pile Driving Aides and Accessories. Provide one copy of a written request for approval to use pre-bore or other special pile driving methods to the Project Manager at least five (5) working days before pile driving is scheduled to begin. The request will detail the proposed equipment required to complete the work. Delays and additional costs resulting from the approved use of special pile driving methods are at Contractor's expense.

1. Followers. Use of followers is not allowed.

2. Helmet. Provide metal helmets for pile to be driven by impact drivers. Helmets will fit around the pile top, be axially aligned with the hammer and pile, distribute the hammer energy to the total pile head cross section and be guided by leads.

3. Hammer Cushion. When driving pile with an impact hammer, use a cushion to prevent damage to the pile and hammer. Use a cushion recommended and approved by the hammer

manufacturer. Use a striker plate recommended by the hammer manufacturer on the hammer cushion to provide uniform compression of the cushion material.

4. Leads. Support the piles in line and position during driving. Use pile hammer leads that permit free movement of the hammer, maintain hammer and pile alignment and provide concentric impact for each blow.

5. Jets. Use of water jets is not allowed.

6. Caps. Follow the pile manufacturer's recommendations regarding caps, driving heads, mandrels or other required devices.

7. Drilling Pile. When specified in the plans, use the prescribed drilling methods discussed herein. If subsurface obstructions are encountered prior to reaching the required bottom of hole elevation, halt drilling operations and notify the Project Manager. If drilling reduces the capacities of previously placed pile, restore the disturbed pile to conditions meeting this specification by re-driving after drilling operations in the area have been completed. Delays and additional costs resulting from remedial measures to restore pile capacity are at Contractor's expense.

A. Pile Pre-Bore (Steel Pipe or H-Pile). When pile pre-bore is specified, use an auger, wet-rotary drill or other approved method at pile locations shown in the plans. Do not impair the capacity of previously installed pile or safety of adjacent structures with the pre-bore. Drill pre-bore holes to the specified diameter and depth. Drive the pile in the pre-bore hole to the bottom of the hole with an approved impact hammer. Continue driving the pile to the ultimate pile capacity and depth specified in the plans. After driving, fill annular void around the pile with dry fine aggregate for concrete meeting the requirements of Standard Specification Section 701.01.1 and Table 701-2.

B. Pile Drill and Socket. (Steel Pipe Pile). At each pile location, drill pilot holes not more than 25 mm in diameter less than the outside diameter of the round pile and not more than 100 mm (4 inches) less than the diagonal length of square or H-pile, to the elevation shown in the plans. Drive the pile into the pre-drilled pilot hole to the bottom of the hole with an approved impact hammer. Continue driving the pile below the bottom of the drilled hole to the design tip elevation specified in the plans, or deeper if directed by the Project Manager.

559.03.2 Approval of Pile Driving Equipment. Pile driving equipment to be provided by the Contractor will be subject Department approval. Do not transport the pile driving equipment to the project site until receiving written Department approval. The equipment must have the capability to drive the project pile to the design pile tip elevation without damage to the pile. Hammer approval will be based on the wave equation analysis. Submit two (2) copies of the pile driving equipment information form (Figure 559-1) to the Project Manager thirty (30) calendar days before driving.

Contract No.: _____ Structure Name and/or No.: _____

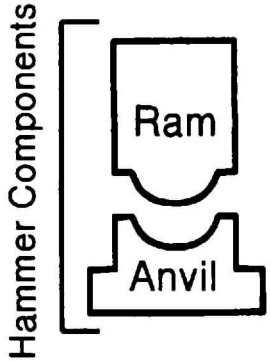
Project: _____ _____

_____ Pile Driving Contractor or Subcontractor: _____

County: _____ _____

(Piles driven by)

Hammer Components



Hammer

Manufacturer: _____ Model No.: _____

Hammer Type: _____ Serial No.: _____

Manufacturers Maximum Rated Energy: _____ (Joules)

Stroke at Maximum Rated Energy: _____ (meters)

Range in Operating Energy: _____ to _____ (Joules)

Range in Operating Stroke: _____ to _____ (meters)

Ram Weight: _____ (kg)

Modifications: _____

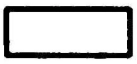
_____

_____

Striker Plate

Weight: _____ (N) Diameter: _____ (mm)

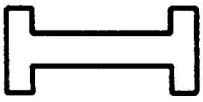
Thickness: _____ (mm)



Hammer Cushion

	Material #1	Material #2 (for Composite Cushion)
Name:	_____	_____
Area:	_____ (cm^2)	_____ (cm^2)
Thickness/Plate:	_____ (mm)	_____ (mm)
No. of Plates:	_____	_____

Total Thickness of Hammer Cushion: _____



Helmet (Drive Head)

Weight: _____ (kN)

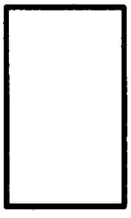
Pile Cushion

Material: _____

Area: _____ (cm^2) Thickness/Sheet: _____ (mm)

No. of Sheets: _____

Total Thickness of Pile Cushion: _____ (mm)



Pile

Pile Type: _____

Wall Thickness: _____ (mm) Taper: _____

Cross Sectional Area: _____ (cm^2) Weight/Meter: _____

Ordered Length: _____ (m)

Design Load: _____ (kN)

Ultimate Pile Capacity: _____ (kN)

Description of Splice: _____

_____

Driving Shoe/Closure Plate Description: _____

_____

Submitted By: _____ Date: _____

Telephone No.: _____ Fax No.: _____

Figure 559-1. Pile and Driving Equipment Data Form

The Department will evaluate the pile driving equipment based on the wave equation analysis results. The following results from the wave equation analysis are required for pile driving equipment approval:

- 35 to 150 blows per 0.3 m (foot) at ultimate capacity
- Maximum compressive driving stress less than 90% of the minimum pile material yield strength

The Project Manager will notify Contractor of acceptance or rejection of the pile driving equipment within ten (10) working days after receipt of the Pile and Driving Equipment Data form. If the proposed pile driving equipment is rejected because the wave equation analysis indicates that pile damage may occur or that the pile cannot be driven to the specified ultimate capacity, the Contractor must re-submit a plan that modifies the equipment or method to ensure the ability to drive pile to the specified ultimate capacity without damaging the pile. The Project Manager will notify the Contractor of acceptance or rejection of the revised pile driving submission within five (5) working days after receipt of the request.

Use the approved system during pile driving operations. Do not vary from the approved driving system without prior written approval by the Project Manager. Proposed changes to the pile driving equipment or method will only be considered after the Contractor has submitted revised information required to perform a new wave equation analysis. The Project Manager will notify the Contractor of acceptance or rejection of the pile driving system changes within five (5) working days after receipt of the request. Delays and additional costs associated with developing, submitting, obtaining approval of pile driving proposals and resulting changes in the pile driving equipment and work methods are at Contractor's expense.

559.03.3 Pile Capacity.

A. Driven Pile Capacity. The Project Manager will use one of the following methods as specified in the Contract to determine driven pile ultimate capacity.

1. Wave Equation. Ultimate pile capacity will be determined by the Department based on a wave equation analysis. Drive piles with the approved pile driving equipment to the ordered length or other lengths necessary to obtain ultimate pile capacity. Do not use other methods to aid pile penetration unless specified or approved after a revised driving resistance is established from the wave equation analysis. Unless otherwise specified, adequate pile penetration is considered to be obtained when the specified wave equation resistance criteria is achieved within 0.3 meter (1 foot) of the pile tip elevation. Drive pile not achieving the specified resistance within these limits to penetrations established by the Project Manager.

2. Dynamic Formula. Ultimate pile capacity will be determined by the Department based on a dynamic formula. Drive pile to obtain the ultimate pile capacity determined by the following formula:

English: $R_u = 0.5[1.75(E_r^{1/2}) \log(10N_b) - 100]$

Metric: $R_u = [7(E_r^{1/2}) \log(10N_b)] - 550$

Where: $\mathbf{R_u}$ = the ultimate pile capacity kN (tons)
$\mathbf{E_r}$ = the manufacturer's rated hammer energy in Joules (ft-lbs) at the field observed ram stroke
$\log(10N_b)$ = logarithm to the base 10 of the quantity multiplied by N_b, the number of hammer blows per 25 mm (1 inch) at final penetration

B. Compression Load Tests.

1. Static Load Tests. Perform the compression load tests meeting the requirements of ASTM D-1143 using the Quick Load test method. Load the test pile to the design load provided by the Department. Provide testing equipment and measuring systems meeting ASTM D-1143 including a load cell and spherical bearing plate. Submit two (2) copies of detailed plans for the proposed loading system prepared by a professional engineer licensed in the State of Montana to the Project Manager for approval twenty (20) working days before the test. The load system will gradually and incrementally place the load on the test pile free of vibration. If the approved method includes tension (reaction) anchor pile, provide anchor pile of the same type and diameter as the service pile. Drive the anchor pile in the location of the permanent pile. Timber or tapered pile installed in permanent locations cannot be used as tension pile.

Determine top elevation of the test and anchor pile immediately after driving and again just before load testing to check for heave. Re-drive all pile that heaved in excess of 6 mm (1/4 inch) or jack the pile to the original elevation before testing. Wait seventy-two (72) hours between driving of the anchor pile or the load test pile and the load test.

The Project Manager will evaluate the pile load settlement curve obtained from the load test to determine the pile capacity. If the Project Manager determines that the pile has failed before achieving the ultimate capacity, additional load tests will be required.

When load testing is complete, remove all test or anchor pile not a part of the finished structure or cut off at least 300 mm (12 inches) below bottom of the footing or the finished ground elevation, if not located within the footing area.

2. Dynamic Load Tests. Use a qualified pile specialty consultant with at least three (3) years experience in dynamic load testing and analysis to perform the dynamic load test, perform the Case Pile Wave Analysis Program (CAPWAP) and the wave equation analysis, including the initial wave equation analysis specified in Standard Specifications Section 559.03.2-A.1. The test should be performed by a Geotechnical Engineer registered as a Professional Engineer in Montana who is qualified in the operation and interpretation of dynamic load tests. The specialty engineer must be on site during the dynamic load tests. State of Submit one (1) copy of the specialty engineer's resume to the Project Manager twenty (20) working days before testing for approval.

Furnish equipment and perform dynamic load tests in accordance with the requirements of ASTM D 4945 for designated dynamic load test pile.

With dynamic testing equipment attached, drive the pile to design tip elevation, or deeper if directed by the Project Manager. The Project Manager will use the ultimate pile capacity measurements at the time of driving or re-striking to determine the required ultimate capacity tip elevation shown in the plans. Reduce the driving energy to the pile to maintain pile stresses below the values specified in Standard Specifications Section 559.03.3-A.2, using additional cushions or reduction of the hammer's output energy. If non-axial driving is indicated, immediately re-align the driving system.

At least 24 hours after the initial driving, re-drive each dynamic load test pile with the instruments attached. Warm the hammer before re-driving by applying at least 20 blows to another pile. Re-drive the dynamic load test pile for a maximum penetration of 150 mm (6 inches), a maximum of 50 blows or to practical refusal, whichever occurs first. Practical refusal is considered as 15 blows per 25 mm (1inch) for steel piles.

Verify the assumption used in the initial wave equation analysis submitted in Standard Specifications Section 559.03.3-A.1 using CAPWAP. Analyze one blow from the original driving and one blow from the re-driving for each pile tested.

Perform additional wave equation analysis with adjustments based on the CAPWAP results. Provide a graph showing blow count versus ultimate capacity. For open-ended diesel hammers, provide a blow count versus stroke graph for the ultimate capacity. Provide the driving stresses, transferred energy and pile capacity as a function of depth for each dynamic load test. Submit results of the dynamic load testing, CAPWAP analysis and wave equation analysis to the Project Manager. The Project Manager will determine the production pile driving criteria and minimum pile tip elevations.

C. Test Pile. Drive test pile at locations shown in the plans to the depths specified by the Project Manager. Drive test pile with impact hammers, unless specified otherwise. The specified length of test pile will be greater than the estimated length of service pile. Use the same driving equipment for driving the test pile and the service pile. Excavate the ground at each test pile to the bottom of the footing elevation before the pile is driven.

Drive test pile to the design pile tip elevation or refusal. Allow test pile that do not reach the driving resistance specified by the Project Manager at a depth of 0.3 meter (1 foot) above the estimated pile tip elevation shown on the plans to set for 12 to 24 hours before being re-driven. Do not use a cold hammer for re-drive. Warm up the hammer before driving begins by applying at least 20 blows to another pile. If the specified driving resistance is not reached by re-driving, the Project Manager may direct the Contractor to drive a portion or all of the remaining test pile length and repeat the set and re-drive procedure. Splice test pile driven to plan grade and not obtaining the driving resistance required and drive until the required capacity is obtained.

The Project Manager will prepare a record of driving the test pile, including the number of hammer blows per 0.3 meters (1 foot) for the entire driven length, the as-driven length of the test pile, cutoff elevation, penetration in ground and other pertinent information. Provide the information listed in Figure 559-1 of Standard Specifications Section 559.03.2 to the Project Manager for inclusion in the project records. If a re-drive is necessary, the Project Manager will record the number of hammer blows per 25 mm (1 inch) of pile movement for the first 0.3 meter (1 foot) of re-drive. Do not order piling to

be used in the permanent structure until test pile data has been reviewed and the Project Manager provides pile order lengths. The Project Manager will provide the pile order length list within five (5) working days after completion of test pile driving specified in the contract.

D. Ultimate Pile Capacity. Drive the pile to the design tip elevation shown on the plans or to a depth necessary to reach the ultimate pile capacity. The ultimate driven pile capacity will be determined by the Project Manager based on the methods listed in Standard Specifications Section 559.03.3.

The ultimate pile capacity of pile driven with vibratory hammers will be based on the driving resistance recorded during impact driving after the vibratory equipment has been removed from the first pile in each group of 10 pile. Splice vibrated pile not reaching the ultimate pile capacity at the ordered length at Contractor's expense, and driven with an impact hammer until the ultimate pile capacity is achieved, as indicated by the requirements of Standard Specifications Section 559.03.3. When the ultimate pile capacity is reached, install the remaining 9 piles to similar depths with similar vibratory hammer power consumption and rate of penetration as the first pile.

559.03.4. Pile Driving Location and Alignment. Drive pile so the pile head at cutoff elevation is within 50 mm (2 inches) of the plan location for bent caps supported by pile and within 150 mm (6 inches) of plan location for pile capped below finish grade. Maintain the driven pile group centroid at cutoff elevation within 5% of the pile group plan load centroid and no pile can be within 100 mm (4 inches) of a cap edge. Pile exceeding 150 mm (6 inches) from the plan location at cutoff elevation will be rejected.

The allowable alignment tolerance from a plumb line is 20 mm (1/4 inch) per 1000 mm (1 foot) of pile length.

The Project Manager may suspend driving if the either the pile location or alignment is not maintained as the pile is driven.

Two (2) working days after driving is completed, submit five (5) copies of a written plan to the Project Manager for correcting pile that do not meet the alignment or location tolerances.

Laterally pulling on mis-aligned pile or splicing a properly aligned section on mis-aligned pile is not allowed.

Delays and additional costs resulting from work required to correct mis-aligned pile is at Contractor's expense.

559.03.5 Service Pile. Furnish the service pile lengths specified in the contract or the lengths from the Project Manager's order list, when test piles are specified. Adjust pile lengths for the difference between cutoff length and the pile position in the driving equipment.

Drive each service pile in one continuous operation.

The Project Manager will observe the pile driving and calculate the predicted pile capacity as it is being driven.

Stop pile driving if the pile top is within 600 mm (2 feet) of cutoff elevation and the predicted capacity has not reached or exceeded the required capacity.

Re-strike the pile not less than 24 hours or more than 72 hours after initial driving and do

not drive the pile below cut off elevation. If the Project Manager determines pile stresses during driving may damage the pile, other installation methods may be required to obtain pile penetration.
Correct or replace improperly driven, broken or other defective pile at Contractor's expense.

559.03.6 Heaved Pile. The Project Manager will take elevation readings to measure pile heave at the start of pile driving operations and until the Project Manager determines that such checking is no longer required. Elevation readings will be taken immediately after the pile has been driven and again after pile within a radius of 5 meters (15 feet) have been driven. If pile heave is observed, the Project Manager will take elevation readings, referenced to a fixed datum, on all pile immediately after installation and as adjacent pile are driven to determine the pile heave range. Re-drive all pile that have heaved more than 6 mm (1/4 inch) to the required resistance or penetration at Contractor's expense.

Do not place concrete in pile casing until pile driving has progressed beyond a radius of 5 meters (16 feet) from the pile to receive concrete. If a pile filled with concrete has heaved, submit a plan for re-driving the pile to the Project Manager for approval, addressing measures to prevent damaging the concrete in the pile.

Drive individual pile in pile groups starting from the center of the group and proceeding outward in both directions or starting at the outside row and proceeding progressively across the group.

559.03.7 Cutting Off Steel or Steel Pipe Pile. Cut steel pile heads square and furnish a driving cap before driving the pile. After pile are driven to the required capacity, cut pile off at the specified elevation. If capping is required, make the connection as specified.

559.03.8 Steel Pipe Pile. Remove water in steel pipe pile before placing concrete or place the concrete using a tremie when water is present in the pile.

Provide lighting to illuminate the full pile length when requested to aid inspection of the pile before placing concrete. Fill steel pipe pile with Class "DD" Portland Cement concrete. Do not place concrete in pipe pile until all pile for the bent have been driven.

559.03.9 Painting Steel Pile and Steel Pile Shells. Paint steel pile and pile shells meeting the following requirements.

A. Paint. Furnish paint meeting the requirements of Standard Specifications Section 710.02 (B)(4).

B. Surface Preparation. Prepare the pipe pile surface to be painted following the paint manufacturer's recommendations.

C. Painting. Follow the paint manufacturer's recommendations for paint application. Apply paint to the pile starting 610 mm (2 feet) below ground surface to the top of exposed steel. Apply paint to pile located in water before driving starting 610 mm (2 feet) below water surface to the top of exposed steel.

1. Shop Painting. Apply the first two paint coats to produce a minimum 300 μm (12 mil) dry film thickness. Provide two (2) copies of the painter's certification that the paint was applied following the manufacturer's recommendations and test results showing the coating thickness on the pile.

2. Field Painting. Repair paint damage caused by transport and handling following the paint manufacturer's recommendations before applying the finish coat.

For the finish coat, use the same paint or paint compatible with the first two coats. Provide a finish coat with a minimum 75 μm (4 mil) dry film thickness. The Project Manager will select the finish coat paint color from one of the following:

COLOR	FEDERAL SPECIFICATION 595A PIGMENT CODE
Montana Brown	33578
Montana Blue	35450
Montana Green	34138

559.04 METHOD OF MEASUREMENT.

559.04.1 Load Tests. Static and dynamic load tests are measured per each completed and accepted test and includes all materials, tools and equipment required to perform each test.

559.04.2 Furnishing Test Pile. Furnishing test pile is measured per linear meter (foot) based on the plan quantity or the length between pile tip and cutoff elevation, if additional length is placed to reach the required capacity or if the required capacity is reached at a higher elevation than shown in the plans.

559.04.3 Driving Test Pile. Driving test pile is measured per linear meter (foot) of pile driven into the ground or below the bottom of pre-bore holes, when pre-boring is required.

559.04.4 Furnishing Pile. Furnish pile is measured per linear meter (foot) based on the plan quantity or the length between pile tip and cutoff elevation, if additional length is placed to reach the required capacity or if the required capacity is reached at a higher elevation than shown in the plans.

559.04.5 Driving Pile. Driving pile is measured per linear meter (foot) of pile driven into the ground or below the bottom of pre-bore holes, when pre-boring is required.

559.04.6 Drilling Pile. Pile pre-bore and pile drill and socket pilot holes are measured per linear meter (foot) drilled below existing or finished ground elevation to bottom of the hole.

559.04.7 Pile Splice. Pile splices are measured per each for the number of pile splices specified in the contract.

Splices approved for Contractor convenience to meet order list lengths or to facilitate driving conditions are not measured for payment.

559.04.8 Pile Driving Point and Cutting Shoe. Pile driving point and cutting shoes are measured per each for the quantity specified in the contract.

559.04.9 Filler Concrete. Filler concrete is not measured for payment.

559.04.10 Painting Steel Pile and Steel Pile Shells. Painting steel pile and steel pile shells is not measured for payment.

559.05 BASIS OF PAYMENT.

No payment is made for furnishing or driving falsework pile, pile driven out of place, defective pile or pile damaged in handling or driving.

Payment for the costs associated with painting steel pile and steel pile shells and filler concrete is included in the unit price bid per linear meter (foot) of Furnishing Pile.

Pile purchased based on the Project Manager's itemized order list, but not incorporated in the finished structure, are paid at invoice price. Deliver the unused piles to the location designated by the Project Manager.

The following percentages of the total quantity of Driving Pile are paid as progress estimates:

1. 95 percent when the piles are driven to final penetration;

2. 100 percent when the piles are cut off and painted as specified in the Contract.

Payment at the contract unit price bid is full compensation for all resources necessary to complete each item of work under the Contract.

Payment for the completed and accepted quantities is based on the following:

Pay Item	**Pay Unit**
Static Load Test	Each
Dynamic Load Test	Each
Furnishing Test Pile	Linear Meter (Foot)
Driving Test Pile	Linear Meter (Foot)
Furnishing Pile	Linear Meter (Foot)
Driving Pile	Linear Meter (Foot)
Pile Pre-bore	Linear Meter (Foot)
Pile Drill and Socket	Linear Meter (Foot)
Pile Splice	Each
Pile Driving Point	Each
Pile Cutting Shoe	Each